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(71)Applicant : TOYO SEIKAN KAISHA LTD

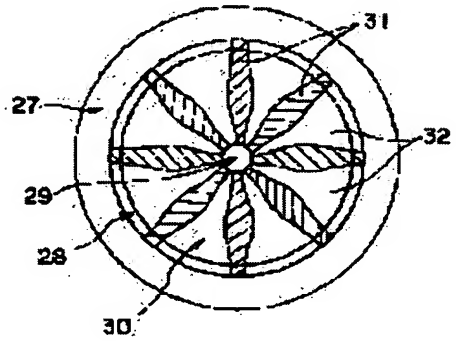
(72)Inventor : SAKURAI EISHIRO
HASHIMOTO HIROYUKI
KANEKO TOMOAKI

(54) BOTTLE MADE OF POLYESTER AND PREFORM TO BE USED FOR MANUFACTURE THEREOF

(57)Abstract:

PURPOSE: To provide a bottle made of polyester by which a sufficient reinforcing effect, pressure-resistance and heat-resistance can be obtained, and the productivity of which is high while keeping the thickness of the container bottom part at a comparatively small level.

CONSTITUTION: A bottle is manufactured of polyester by a biaxial orientation blow-forming, and is equipped with a mouth part, a truncated-cone shoulder part which continues from the mouth part, cylindrical body part and closed bottom part, and the bottom part consists of an outer peripheral part 27 the diameter of which becomes smaller downward, ground part 28 which continues from the outer peripheral part 27, bottom central part 29, and curved part 30 which connects the bottom central part and ground part and protrudes upward. For such a bottle made of polyester, on the curved part and ground part, a plurality of crystalized reinforcing bands 31 which extend radially from the bottom central part at least to the ground part, and are whitened by crystalization from the external surface to a middle in the thickness direction are alternately provided with non-whitened areas 32 in-between.



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* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] The periphery section to which it is manufactured by the biaxial stretching blow molding of polyester, and has the truncated-pyramidical shoulder, the tubed drum section, and lock out pars basilaris ossis occipitalis which stand in a row in a top neck part and this, and, as for said pars basilaris ossis occipitalis, a path becomes small downward, In the bottle made from polyester which changes upward which connects the touch-down section which stands in a row in this, a bottom core, and a bottom core and the touch-down section from the bend of a convex in said bend and the touch-down section The bottle made from polyester with which the pars basilaris ossis occipitalis characterized by forming by turns two or more crystallization reinforcing bands which have been prolonged from the pars-basilaris-ossis-occipitalis core in the radial to the touch-down section at least, and were milked by crystallization from an outside surface to the middle of the thickness direction through a non-milking region was strengthened.
[Claim 2] Biaxial-stretching-blow-molding preforming characterized by forming by turns the crystallization milkiness band equipped with the side-attachment-wall section which is formed with injection molding of polyester and stands in a row in a top neck part and this, and a lock out pars basilaris ossis occipitalis which set spacing in the lower part of said side-attachment-wall section in preforming used for the biaxial stretching blow molding to a bottle in the hoop direction, and has been prolonged in the lengthwise direction or the spiral direction through a non-milking region.
[Claim 3] said crystallization milkiness band -- the outside surface of the side-attachment-wall section to the thickness direction -- on the way -- preforming according to claim 2 which was boiled, and has been milked so that it may reach.
[Claim 4]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the bottle made from polyester which has the structure reinforced to deformation by the pressure or heat, while the thinning of the pars basilaris ossis occipitalis is carried out more to the detail about preforming for manufacturing the bottle made from polyester and it which have the improved pars-basilaris-ossis-occipitalis structure.
[0002]
[Description of the Prior Art] The bottle which carries out extension blow molding of polyester like polyethylene terephthalate (PET), and changes is lightweight, excellent in shock resistance and transparency, and since it moreover excels also in permeability-proof, it has come to be widely used as a container for holding various drinks especially Biel and a carbonic acid system drink or oolong tea, fruit juice, etc. In this bottle, pressure resistance and the part which poses a problem most in respect of thermal resistance are partes basilaris ossis occipitalis, and in order to introduce a reinforcement structure into introducing various reinforcement structures into a pars basilaris ossis occipitalis, and a pars basilaris ossis occipitalis, some proposals are already made also about preparing a rib etc. in preforming.
[0003] For example, in preforming for biaxial stretching blow molding, making two or more protruding line ribs form in the wall surface of a pars basilaris ossis occipitalis along the vertical direction is indicated by JP,55-71245,A. Moreover, in the biaxial-stretching-blow-molding polyester bottle, while forming the galea of the inner sense in a pars basilaris ossis occipitalis, preparing in a radial the protruding line rib of two or more solids which results in the lower part of a drum section from the upper limit section of galea is indicated by JP,63-11212,B. Furthermore, in a biaxial-stretching-blow-molding polyester bottle, two or more heavy-gage ribs are prepared in a radial from the core at a pars basilaris ossis occipitalis, and crystallizing a pars basilaris ossis occipitalis in the perimeter parts of a rib and a rib is indicated by JP,60-172636,A.
[0004] As other proposals which prepare a reinforcing rib in preforming, the longitudinal rib of the letter of a projection is prepared in the wall surface of a pars basilaris ossis occipitalis within and without a wall surface, in this longitudinal rib, it is perpendicular to JP,4-25296,Y and making it be on the same field is indicated.
[0005]
[Problem(s) to be Solved by the Invention] Although preforming which prepared the heavy-gage rib is used for the part which the proposal in the above-mentioned advanced technology tends to raise pressure resistance and thermal resistance according to the reinforcement effectiveness by preparing a rib in a pars basilaris ossis occipitalis, and serves as a pars basilaris ossis occipitalis It was not what it may still be satisfied with the purpose of making sufficient reinforcement effectiveness discover, and the purpose of performing the production efficiently of enough, saving the amount of superintendent officers of a bottle.
[0006] If preforming which prepared the heavy-gage rib in the part used as a pars basilaris ossis occipitalis is used for biaxial stretching blow molding, surely a reinforcing rib can be formed in a bottle pars basilaris ossis occipitalis, but since a flow of resin arises at the time of blow molding, it cannot be made heavy-gage, so that the reinforcing rib was meant, and the reinforcement effectiveness which is like [expected] cannot be acquired.

[0007] Of course, although a reinforcing rib will also become thick and sufficient reinforcement effectiveness will be acquired to a pressure if thickness of the whole pars basilaris ossis occipitalis is thickened, the fault that the amount of superintendent officers of a bottle increases, the weight of a bottle becomes large in this case, and that manufacturing cost also becomes high is produced. According to the experiment by this invention persons, although there was a certain amount of effectiveness in pressure-resistant improvement, the pressure-resistant improvement in a bottle pars basilaris ossis occipitalis and prevention of heat deformation of a pars basilaris ossis occipitalis found that a thick reinforcing rib was not so effective.
[0008] although it be effective to prepare two or more heavy-gage ribs in a radial from that core in this point at the proposal see by JP,60-172636,A , i.e. , a pars basilaris ossis occipitalis , and to crystallize a pars basilaris ossis occipitalis in the perimeter parts of a rib and a rib when give thermal resistance to a bottle pars basilaris ossis occipitalis , by this proposal , heat the bottle pars basilaris ossis occipitalis after shaping , it be make to crystalize , and there be a fault that there be nothing if it be **** , therefore productivity be bad , and equipment be enlarge .
[0009] Therefore, maintaining the thickness as the whole container pars basilaris ossis occipitalis at comparatively small level, sufficient reinforcement effectiveness, and the pressure resistance and thermal resistance by it are obtained, moreover, the productivity of the purpose of this invention is also high, and offering the easy bottle made from polyester also has manufacture.
[0010] The reinforcing band of sufficient thickness is secured and other purposes of this invention are to offer preforming used for the bottle made from polyester with which a pars basilaris ossis occipitalis moreover has the structure of rigidity and tough nature which balanced, and its manufacture, also when the thickness as the whole pars basilaris ossis occipitalis is small.
[0011] The purpose of further others of this invention is to offer preforming for polyester bottle formation to which installation of the crystallization reinforcing band to a pars basilaris ossis occipitalis has already been performed in the phase of preforming while shaping to a predetermined configuration and the bottom configuration of a dimension is easily performed on the occasion of extension blow molding.
[0012]
[Means for Solving the Problem] The periphery section to which according to this invention it is manufactured by the biaxial stretching blow molding of polyester, and has the truncated-pyramidical shoulder, the tubed drum section, and lock out pars basilaris ossis occipitalis which stand in a row in a top neck part and this, and, as for said pars basilaris ossis occipitalis, a path becomes small downward, In the bottle made from polyester which changes upward which connects the touch-down section which stands in a row in this, a bottom core, and a bottom core and the touch-down section from the bend of a convex in said bend and the touch-down section The bottle made from polyester with which the pars basilaris ossis occipitalis characterized by forming by turns two or more crystallization reinforcing bands which have been prolonged from the pars-basilaris-ossis-occipitalis core in the radial to the touch-down section at least, and were milked by crystallization from an outside surface to the middle of the thickness direction through a non-milking region was strengthened is offered.
[0013] In preforming equipped with the side-attachment-wall section which according to this invention is formed with injection molding of polyester and stands in a row in a top neck part and this again, and a lock out pars basilaris ossis occipitalis used for the biaxial stretching blow molding to a bottle, the lower part of said side-attachment-wall section is provided with biaxial-stretching-blow-molding preforming characterized by forming by turns the crystallization milkiness band which set spacing to the hoop direction and has been prolonged in the lengthwise direction or the spiral direction through a non-milking region. Said crystallization milkiness band is good to have milked so that it may reach in the middle of the thickness direction from the outside surface of the side-attachment-wall section.
[0014] In preforming which is used for the biaxial stretching blow molding to the bottle equipped with the side-attachment-wall section which is further formed with injection molding of polyester, and stands in a row in a top neck part and this, and a lock out pars basilaris ossis occipitalis according to this invention And the narrow diameter portion extracted to the almost same thickness as the upper part is formed. the taper-like connection to which a path becomes small gradually at the

lower part of said side attachment wall -- minding -- the upper part -- a minor diameter -- in this connection and narrow diameter portion Preforming for biaxial stretching blow molding characterized by for the rib having set spacing to the hoop direction, and having prepared it in it outside the lengthwise direction, and said most outside ribs having milked by crystallization so that a crowning may become flat-tapped with a side-attachment-wall peripheral face is offered.
[0015]
[Function] The periphery section to which it is manufactured by the biaxial stretching blow molding of polyester, and has the truncated-pyramidical shoulder, the tubed drum section, and lock out pars basilaris ossis occipitalis which stand in a row in a top neck part and this like [the bottle of this invention] a well-known bottle, and, as for this pars basilaris ossis occipitalis, a path becomes small downward, Although it has the bend of a convex upward which connects the touch-down section which stands in a row in this, a bottom core, and a bottom core and the touch-down section It is the remarkable description to have formed by turns two or more crystallization reinforcing bands which have been prolonged from the pars-basilaris-ossis-occipitalis core in the radial to the touch-down section at least, and were milked by crystallization from an outside surface to the middle of the thickness direction through the non-milking region in a bend and the touch-down section.
[0016] It is a part from the touch-down section on which stress tends to concentrate the weakest part, and the touch-down section to a bend to a pressure and heat among bottle partes basilaris ossis occipitalis, and if these parts carry out bulge deformation, the independence stability of a bottle is spoiled, or also when independence nature is not spoiled, a bottle will produce the locking phenomenon which shakes in a longitudinal direction. Moreover, if such bulge deformation is produced, a crack will occur into this part, and there is an inclination for the reinforcement of a container wall itself to fall.
[0017] In this invention, in order to prevent this, two or more crystallization reinforcing bands are formed in a bend and the touch-down section so that it may extend from a pars-basilaris-ossis-occipitalis core in a radial to the touch-down section at least. Since polyester is crystallized, this reinforcing band has large rigidity, its heat deflection temperature is also high, and a pressure and also when heat is added further, it prevents bulge deformation effectively.
[0018] This crystallization reinforcing band is being formed by crystallizing from an outside surface to the middle of the thickness direction, and a radial, and especially the thing established by turns through the non-milking region is important for it. Namely, with this pars-basilaris-ossis-occipitalis structure of this invention, a crystallization (milkiness) reinforcing band with rigidity serves as rib structure which became independent mutually. It becomes the umbrella cloth structure supported in rib structure after the extension polyester layer (non-milked partial + non-milking region of a reinforcing band) which has tough nature on the other hand has continued. It will be understood that it is that with which the pressure was fully borne from the top and rigidity and tough nature were moreover combined also with the structure where the whole pars-basilaris-ossis-occipitalis container wall is thin.
[0019] The bottle of this pars-basilaris-ossis-occipitalis structure of this invention is preforming equipped with the side-attachment-wall section which is formed with injection molding of polyester and stands in a row in a top neck part and this, and a lock out pars basilaris ossis occipitalis, and when the crystallization milkiness band which set spacing to the hoop direction and has been prolonged in the lengthwise direction or the spiral direction uses what is prepared by turns through the non-milking region and carries out biaxial stretching blow molding of this to the lower part of the side-attachment-wall section, it is manufactured.
[0020] If this preforming is used for biaxial stretching blow molding, the crystallization milkiness band of preforming will turn into a crystallization reinforcing band of a bottle pars basilaris ossis occipitalis, and the non-milking region of preforming will turn into a non-milking region of a bottle pars basilaris ossis occipitalis, and the bottle pars-basilaris-ossis-occipitalis structure mentioned above will be formed. Since there is little deformation at the time of biaxial stretching blow molding as for the crystallization milkiness band of preforming and it serves as the extension initiation fixed end of a non-milking region especially at it, the draw magnification of a non-milking region becomes high and also brings about the advantage that molecular orientation of a non-milking region is performed effectively.

[0021] In the condition of preforming, in order to manufacture the bottle of this invention, since the crystallization thru/or milkiness by heating is performed, there is no troublesomeness which heats the bottle pars basilaris ossis occipitalis after shaping, and there is an advantage that a process is easy and does not need what also has a large-scale manufacturing installation. Furthermore, heating-from periphery side of preforming heating actuation is also easy, and in heating from this periphery side, since the crystallization milkiness band of preforming is milked so that it may reach in the middle of the thickness direction from the outside surface of the side-attachment-wall section, there is an advantage that formation of the rib-umbrella cloth structure mentioned above is easily obtained by biaxial stretching blow molding by this.
[0022] the taper-like connection to which a path becomes small gradually in suitable preforming of this invention at the lower part of a preforming side attachment wall especially -- minding -- the upper part -- a minor diameter -- and the narrow diameter portion extracted to the almost same thickness as the upper part is formed, and outside a lengthwise direction, a rib is set to a hoop direction, spacing is prepared so that a crowning may become flat-tapped with a side-attachment-wall peripheral face, and moreover, this connection and narrow diameter portion are made to milk most outside ribs by crystallization
[0023] Outside this configuration, with a rib, since the thickness of the wall of the part which prepared the outside rib becomes large and the outside rib is moreover crystalized, it becomes possible to form the crystallization reinforcing band of sufficient thickness in a bottle pars basilaris ossis occipitalis. Since the preforming lower part used as a bottle pars basilaris ossis occipitalis is extracted to the minor diameter as compared with the preforming upper part, the hoop direction draw magnification of this part becomes large, and it should also be understood also whenever [molecular orientation / of a bottle pars basilaris ossis occipitalis], and that it can do greatly.
[0024] Moreover, since the outside rib has projected to the method of the outside of a path as compared with other side-attachment-wall lower parts, when preforming is heated from a perimeter, the advantage that heat crystallization only of the outside rib can be carried out alternatively is given. Thus, according to this invention, since heat concentrates on an outside rib, in the phase of heat treatment for heating preforming to extension temperature, heat crystallization of the outside rib can be carried out, a routing counter is also lessened and the advantage to say that productivity may be raised is given.
[0025]
[Example] This invention is explained from preforming for bottle formation so that easily [the understanding].
[0026] In drawing 1 (side elevation) and drawing 2 (sectional view of A-A of drawing 1 , B-B, C-C, D-D, and E-E) which show suitable preforming of [preforming] this invention, this preforming P was formed by injection molding of polyester, was divided roughly, and is equipped with the top neck part 1, and the side-attachment-wall section 3 and the lock out pars basilaris ossis occipitalis 4 which stand in a row through the upper part connection 2 in this. The top neck part 1 is equipped with the opening edge 5 for seal, the screw section 6 for lid engagement, and a retaining ring 7. In this example, although the upper part connection 2 has a top neck part 1 and the almost same bore, an outer diameter increases downward and thickness is also increasing downward. The lock out pars basilaris ossis occipitalis 4 serves as circular.
[0027] The side attachment wall 3 consists of the upper part 8, the lower part 9, and the taper-like connection 10 between these. that to which, as for the taper-like connection 10, a path (a bore and outer diameter) becomes small gradually downward -- it is -- the lower part 9 -- this taper-like connection 10 -- minding -- the upper part 8 -- a minor diameter -- and it is extracted to the almost same thickness as the upper part 9, and the narrow diameter portion is formed.
[0028] Outside the lengthwise direction, a rib 13 sets spacing to a hoop direction, and is prepared in this connection 10 and narrow diameter portion (lower part) 9 a large number (the example of drawing 8) in it so that it may be well shown in drawing 2 , and a crowning 11 may become flat-tapped with the side-attachment-wall peripheral face 12.
[0029] In this invention, although a rib 13 is milked by heat crystallization outside these, narrow diameter portions 9 other than an outside rib (lower part) serve as a non-milking region. Although the outside rib 13 is seen in that cross section, most milks by heat crystallization and it changes with

the crystallization milkiness band 14, it does not necessarily need for all to have milked (in addition in this example, the outside rib 13 and the crystallization milkiness band 14 overlap). Of course, it should be understood that the part inside the outside rib 13 serves as a non-milking region.
[0030] Although extent of crystallization of the outside rib 13 is enough if this part has milked, densimetry degree of crystallinity can estimate it strictly. 25% or more, if this degree of crystallinity is especially 35% or more, it can give sufficient thermal resistance and pressure resistance.
[0031] In addition, densimetry degree of crystallinity is the value which the consistency of polyester was measured with the density gradient tube method, and was asked for degree of crystallinity X (%) by the degree type.
[Equation 1]

$$\frac{1}{d} = \frac{1-X}{da} + \frac{X}{dc} \quad \left(X = \frac{dc}{d} \times \frac{d-da}{dc-da} \times 100\right)$$

However, d is the measurement consistency (g/cm3) in 25 degrees C, da =1.335 g/cm3 (consistency of perfect amorphous polyester), and dc =1.455 g/cm3 (consistency of perfect-crystal polyester).
[0032] Although especially the configuration of the outside rib 13 is not restricted, by the example shown in drawing, it is a hemicycle and, otherwise, the configuration of arbitration, such as quadratic curves, such as a parabola, a hyperbola, and an ellipse, and a cycloid, a triangle, a trapezoid, can be taken.
[0033] although the magnitude of the outside rib 13 changes also with the magnitude of a container and cannot generally be specified -- the case of the usual container, for example, the bottle containing 1500ml of inner capacity, -- the height of the outside rib 13 -- 15 thru/or 40mm -- especially -- the range of 20 thru/or 30mm -- moreover, it is desirable 2 thru/or that 8mm especially of the width of face is in 3 thru/or the range of 5mm. Moreover, as for the number of the outside rib 13 prepared in the preforming lower part, generally, it is [12] desirable 3 thru/or that it is 5 thru/or about 10 especially. Furthermore, although the die length of the outside rib 13 balances mostly the distance from the core of a bottle pars basilaris ossis occipitalis to the touch-down section and is based also on the magnitude of a bottle, generally it is desirable 20 thru/or that there is 100mm especially in 30 thru/or the range of 60mm.
[0034] Preforming of this invention consists of thermoplastic polyester. The so-called reforming PET which made the small quantity of other glycols, such as a hexahydro xylylene glycol, contain as thermoplastic polyester as the thermoplastic polyester which makes an ethylene terephthalate unit a subject, for example, polyethylene terephthalate, (PET), and a glycol component, or made the small quantity of other dibasic-acid components, such as isophthalic acid and a hexahydro terephthalic acid, contain as a dibasic-acid component is used. Even if these polyester is independent, it can be used in the range which does not spoil the essence also in the form of a blend object with other resin, such as nylon of a small amount, a polycarbonate, or polyarylate. Moreover, thermoplastic polyester may be used as an inside-and-outside layer, and you may be multilayer structure with gas barrier nature resin interlayers, such as half-aromatic series nylon, such as an ethylene-vinylalcohol copolymer and metaxylylene adipamide.
[0035] The intrinsic viscosity (eta) of the thermoplastic polyester to be used is good in grade for bottle formation, and also includes a multilayer configuration with EVOH, MX-nylon, etc. What that of is in the range of 0.70 thru/or 0.90 dl/g especially, and has 1.60 or less % of the weight of contents of a diethylene-glycol unit especially in 1.50 or less % of the weight of within the limits is used suitably. [0.65 or more]
[0036] Preforming used for extension blow molding is manufactured by the well-known injection-molding method in itself. That is, melting polyester is injected and closed-end preforming of said configuration equipped with the top neck part corresponding to the last container is manufactured in the amorphous condition. Although especially the radiation condition etc. was not limited, generally, it is 60kg/cm2 in 260 thru/or the injection temperature of 300 degrees C, 30, or injection pressure, and can fabricate preforming.
[0037] Since thermal resistance and rigidity are given to preforming obtained in this way, there is a case where crystalize by heat treatment and the opening neck which has the screwing section, the

fitting section, a retaining ring, etc. is made to milk in the phase of preforming, on the other hand, the below-mentioned biaxial extension blow may be completed, a slack thing may be crystalized after the completion of bottle shaping, and the opening neck of a non-extended part may be milked. In preforming of this invention, although being formed in an outside rib is most desirable as for a crystallization reinforcing band, it is not necessarily limited to this example.

[0038] In drawing 3 (part a cross-section side elevation and a bottom view) which shows other examples of preforming, this preforming P is formed by injection molding of polyester, and although it has too the top neck part 1, and the side-attachment-wall section 3 and the lock out pars basilaris ossis occipitalis 4 which stand in a row through the upper part connection 2 in this, two or more crystallization milkiness bands 14 prolonged into the lower part part 9 of a drum section from the pars basilaris ossis occipitalis 4 at the radial are formed. This crystallization milkiness band 14 is formed by heat-treating preforming after shaping so that it may reach in the middle of the thickness direction from an outside surface.

[0039] In drawing 4 for explaining this heat treatment, the masking unit 15 for pars-basilaris-ossis-occipitalis crystallization is used for the fabricated preforming P, this unit 15 is inserted in the bottom outside side of Preforming P, and heat treatment for crystallization is performed. The unit 15 has the heat cutoff wall 16 and the aperture 17 which carried out opening for crystallization milkiness zoning, and the crystallization milkiness band of the configuration corresponding to an aperture 17 and a dimension is formed in preforming 2 by the infrared radiation which passed this aperture. In this case, since processing temperature differs, generally heating for crystallization milkiness zoning and heating to the extension temperature of preforming are performed to two steps.

[0040] In the preforming P of this invention, although the crystallization reinforcing band 14 was formed in the pars basilaris ossis occipitalis at the radial and it has extended a little also in the drum section lower part at shaft orientations, the milkiness band may be prolonged spirally that what is necessary is just to have extended in the direction of the outside of a path from the pars-basilaris-ossis-occipitalis core.

[0041] In drawing 5 (part a cross-section side elevation and a bottom view) which shows the example of further others of preforming, as for this preforming P, the point that two or more crystallization milkiness bands 14 with which it is spirally prolonged into the lower part part 9 of the core of a pars basilaris ossis occipitalis 4 to a drum section although the structure as the whole is common in drawing 4 are formed is different. It is formed by heat-treating preforming after shaping like drawing 4 so that this crystallization milkiness band 14 may also reach in the middle of the thickness direction from an outside surface.

[0042] In drawing 6 , drawing 7 , and drawing 8 (part cross-section side elevation) which show an example of arrangement of the heatproof of [bottle] this invention thru/or the whole heat-and-pressure-proof bottle, this heatproof thru/or the proof-pressure bottle B are equipped with the top neck part 25 which consists of the tubed drum section 21, the campanulate (the shape of a cone) shoulder 22 connected to the upper limit of a drum section, the support ring 23 of the shoulder upper part, and the nozzle section 24 of the ring upper part. The pars basilaris ossis occipitalis 26 explained to a detail below is formed in the lower limit of the tubed drum section 21.

[0043] The heatproof of this invention and/or the pars basilaris ossis occipitalis 26 in the proof-pressure bottle B change downward from the bend 30 of a convex upward which connects the periphery section 27 to which a path becomes small, the touch-down section 28 which stands in a row in this, the bottom core 29, and the bottom core 29 and the touch-down section 28.

[0044] In the example shown in drawing 6 , the bottom periphery section 27 is making the curve of a convex facing down and outward, and this thing is useful as a stable heat-resistant bottle of a bottle. In the example shown in drawing 7 , while the bottom periphery section 27 is making the curve of a convex to facing up and the inner sense, facing down projects and this thing has the touch-down section 28 useful [the section] as a proof-pressure bottle without the buckling to the pressure of a pars basilaris ossis occipitalis. In the example shown in drawing 8 , although the bottom periphery section 27 is the same as that of the thing of drawing 7 , the height of the bottom core 29 from the touch-down section 28 is high, the curvature of a bend 30 is also large and its deformation of a bottom is more useful for the application which becomes severe, for example, the application as a heat-and-pressure-proof bottle. In any [these] case, the standup inside the touch-down section 28 is

good to carry out 90 degrees or the rapid standup near 90 degrees in respect of pressure resistance.
[0045] In this invention, two or more crystallization reinforcing bands which have been prolonged from the pars-basilaris-ossis-occipitalis core 29 in the radial (the shape of a spiral is also included) to the touch-down section 28 at least, and were milked by crystallization from an outside surface to the middle of the thickness direction are formed in these bends 30 and the touch-down section 28 by turns through a non-milking region.
[0046] In the direction periphery cross-section development view of X-X-axis (drawing 10) in drawing 9 (bottom view) and drawing 6 which a little, and show it, the crystallization reinforcing band 31 (a slash shows.) of two or more radials (drawing 10) is formed in a bend 30 and the touch-down section 28. [drawing 6] [the bottle pars basilaris ossis occipitalis 26 of drawing 6] [**] [type] The non-milking region 32 is located between the crystallization reinforcing bands 31, and these are arranged by turns. As for the crystallization reinforcing band 31, having extended in the radial so that it may pass along the touch-down section 28 at least will be understood from the boundary based on [29] partes basilaris ossis occipitalis.
[0047] As best shown in the cross-section development view of drawing 10 , the crystallization reinforcing band 31 is formed so that it may result in the middle of the thickness direction of a bottom wall from the inferior surface of tongue of a pars basilaris ossis occipitalis, and the upper part is covered in the non-milking region 32. By the example shown in drawing 10 , in the crystallization reinforcing band 31 and its near, as compared with other parts, it is rising a little heavy-gage, and rib-umbrella cloth structure is made firmer. in the thing of drawing 9 , although the crystallization reinforcing band 31 is formed so that it may result in the rim of the touch-down section 28, it is natural -- this -- going past -- the bottom periphery section -- or even the lower limit edge of a drum section may be arrived at further.
[0048] In this invention, although average thickness, width of face, die length, crystallinity, etc. of a crystallization reinforcing band are almost equal to it of preforming since there is little change in biaxial stretching blow molding, breadth and thickness may decrease [width of face] a little. Generally in this invention, the height (H) of 50 thru/or 70mm, and a bottom core is [the bore of the touch-down section, and the outer diameter (D) of a bend] good to be in 15 thru/or the range of 30mm generally. The bottle drum section of this invention may have the label attachment section which can have well-known drum section structure of course in itself, for example, was bordered, and the panel-rib structure for reduced pressure absorption.
[0049] preforming for blow molding in which the crystallization milkiness band which mentioned the bottle of this invention above was formed -- extension temperature -- generally a biaxial-stretching blow is carried out at the temperature of 95 thru/or 120. While equipping with preforming by which preheating was carried out to the above-mentioned temperature in hollow metal mold and making a hoop direction carry out expansion extension of this preforming, pull to shaft orientations, and they are made to extend, and it bottoms out.
[0050] the draw magnification in the last container -- an area scale factor -- 5 thru/or 14 times -- especially -- 7 thru/or 12 times -- suitable -- on the other hand -- a shaft-orientations extension line scale factor -- 2 -- or it considers especially as 2.5 thru/or 3 times, and especially a hoop direction extension line scale factor is [5 times] 3.5 times better 2 thru/or to consider as 3 thru/or 4 times.
[0051] The polyethylene terephthalate (PET) of the grade for example 1. injection was injected at the temperature of 300 degrees C, and preforming of the configuration shown in drawing 1 and drawing 2 was manufactured. The dimension of each part is as follows.
[0052] PET metsuke amount 63g, aperture 28mm, overall height 147.5mm, a drum up outer diameter 29.3mm, a drum up bore 19.8mm, a drum lower outer diameter 28mm, a drum lower bore 19mm, drum lower die length 40mm, outside rib die length 40mm, outside rib height 2.6mm, outside rib width of face 5mm.
[0053] While heating with an infrared-heating vessel and carrying out preheating of the whole preforming to extension temperature, rotating preforming with the rib outside the above, the outside rib was made to milk by crystallization. Although the skin temperature of an outside rib was milked at 140 degrees C, having not milked the other part was checked. The degree of crystallinity of an outside rib was 35%, and the degree of crystallinity of the other place was 15%. In the outside rib, the milkiness thickness in the thickest part was 3mm.

[0054] This preforming was fabricated with well-known biaxial-stretching-blow-molding equipment in the bottle of the following dimension.
Content volume 1500ml, aperture 28mm, overall height 305mm, drum section overall diameter Bore of 98mm and the pars-basilaris-ossis-occipitalis touch-down section (D) 60mm, height of a core (H) 20mm, ratio of H/D 0.33 [0055] After filling up the above-mentioned bottle with 800g of 85-degree C hot water and leaving it in it for 3 minutes, hot water was removed in it and the height based on [from the ground plane before a pack] bottoms and it after a pack were compared with it. The variation of height was 1.55mm.
[0056] a comparison sake -- the same eye as an example 1 -- the price -- the bottle was manufactured like the above by preforming of an amount except using what is not crystalized. About this bottle, when the same trial as the above was performed, the variation of height is 4.30mm and the bottle of this invention was notably excellent in thermal stability.
[0057]
[Effect of the Invention] In the biaxial-stretching-blow-molding bottle which has the bend of a convex upward which connects the periphery section to which a path becomes small downward, the touch-down section which stands in a row in this, a bottom core, and a bottom core and the touch-down section according to this invention By having formed by turns two or more crystallization reinforcing bands which have been prolonged from the pars-basilaris-ossis-occipitalis core in the radial to the touch-down section at least, and were milked by crystallization from an outside surface to the middle of the thickness direction through the non-milking region in these bends and the touch-down section Sufficient reinforcement effectiveness, and the pressure resistance and thermal resistance by it are obtained maintaining the thickness as the whole container pars basilaris ossis occipitalis at comparatively small level.
[0058] Since polyester is crystallized, this reinforcing band has large rigidity, its heat deflection temperature is also high, and a pressure and also when heat is added further, it prevents bulge deformation effectively. Since this crystallization reinforcing band is formed by crystallizing from an outside surface to the middle of the thickness direction, and it is moreover a radial and is prepared by turns through the non-milking region, A crystallization (milkiness) reinforcing band with rigidity serves as rib structure which became independent mutually. It became the umbrella cloth structure supported in rib structure after the extension polyester layer (non-milked partial + non-milking region of a reinforcing band) which has tough nature on the other hand has continued, and also with the structure where the whole pars-basilaris-ossis-occipitalis container wall is thin, the pressure was fully borne from the top and, moreover, rigidity and tough nature were put together.
[0059] Since the bottle of this pars-basilaris-ossis-occipitalis structure of this invention is manufactured when the crystallization milkiness band which set spacing to the hoop direction and has been prolonged in the lengthwise direction or the spiral direction uses preforming prepared by turns through the non-milking region and carries out biaxial stretching blow molding of this to the lower part of the side-attachment-wall section, its crystallization process by heat treatment from after is unnecessary, and it brings about the advantage that manufacture is also easy. Moreover, since there is little deformation at the time of biaxial stretching blow molding as for the crystallization milkiness band of preforming and it serves as the extension initiation fixed end of a non-milking region at it, the draw magnification of a non-milking region becomes high and also brings about the advantage that molecular orientation of a non-milking region is performed effectively.
[0060] By this invention, in the condition of preforming, since the crystallization thru/or milkiness by heating is performed, there is no troublesomeness which heats the bottle pars basilaris ossis occipitalis after shaping, and there is an advantage that a process is easy and does not need what also has a large-scale manufacturing installation. Furthermore, heating-from periphery side of preforming heating actuation is also easy, and in heating from this periphery side, since the crystallization milkiness band of preforming is milked so that it may reach in the middle of the thickness direction from the outside surface of the side-attachment-wall section, there is an advantage that formation of the rib-umbrella cloth structure mentioned above is easily obtained by biaxial stretching blow molding by this.
[0061] In preforming which prepared especially the outside rib, since the outside [this] rib has projected to the method of the outside of a path as compared with other side-attachment-wall lower

parts, when preforming is heated from a perimeter, the advantage that heat crystallization only of the outside rib can be carried out alternatively is given. Thus, according to this invention, since heat concentrates on an outside rib, in the phase of heat treatment for heating preforming to extension temperature, heat crystallization of the outside rib can be carried out, a routing counter is also lessened and the advantage to say that productivity may be raised is given.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the side elevation showing suitable preforming of this invention.
[Drawing 2] It is the sectional view of A-A of drawing 1 , B-B, C-C, D-D, and E-E, and A, B, C, D, and E are equivalent to the cross section of A-A, B-B, C-C, D-D, and E-E.
[Drawing 3] other examples of preforming of this invention are shown -- they are a cross-section side elevation and a bottom view a part.
[Drawing 4] It is an explanatory view for explaining heat treatment for forming preforming of drawing 3 .
[Drawing 5] the example of further others of preforming of this invention is shown -- they are a cross-section side elevation and a bottom view a part.
[Drawing 6] an example of arrangement of the whole example of the heat-resistant bottle of this invention is shown -- it is a cross-section side elevation a part.
[Drawing 7] an example of arrangement of the whole example of the proof-pressure bottle of this invention is shown -- it is a cross-section side elevation a part.
[Drawing 8] an example of arrangement of the whole example of the heat-and-pressure-proof bottle of this invention is shown -- it is a cross-section side elevation a part.
[Drawing 9] It is the bottom view in which a little, and showing it. [the bottle pars basilaris ossis occipitalis of drawing 6] [**] [type]
[Drawing 10] It is the direction periphery cross-section development view of X-X-axis in drawing 6 .

[Description of Notations]
P Preforming
1 Top Neck Part
2 Upper Part Connection
3 Side-Attachment-Wall Section
4 Lock Out Pars Basilaris Ossis Occipitalis
5 Opening Edge for Seal
6 Screw Section for Lid Engagement
7 Retaining Ring
8 Upper Part of Side Attachment Wall
9 Lower Part of Side Attachment Wall
10 Taper-like Connection
11 Crowning of Outside Rib
12 Side-Attachment-Wall Peripheral Face
13 Outside Rib
14 Crystallization Milkiness Band
15 Masking Unit for Pars-Basilaris-Ossis-Occipitalis Crystallization
16 Heat Cutoff Wall
17 Aperture Which Carried Out Opening for Crystallization Milkiness Zoning
B A heatproof thru/or a proof-pressure bottle
21 Tubed Drum Section
22 Cone-like Shoulder

23 Support Ring
24 Nozzle Section
25 Top Neck Part
26 Pars Basilaris Ossis Occipitalis
27 Periphery Section
28 Touch-down Section
29 Bottom Core
30 Bend
31 Crystallization Reinforcing Band
32 Non-Milking Region

[Translation done.]

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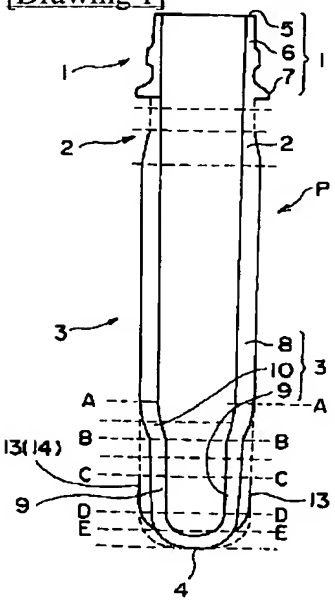
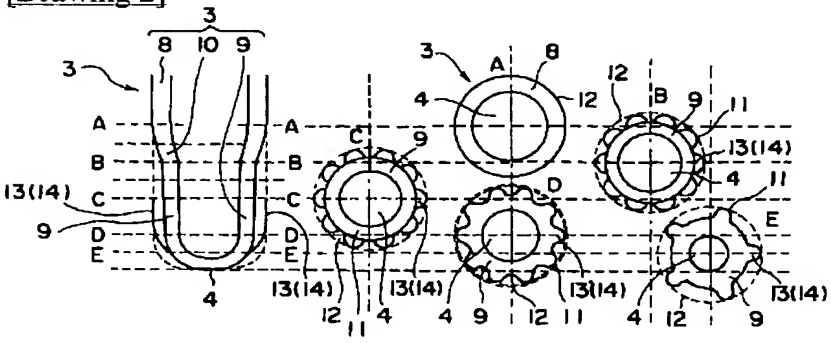
DRAWINGS

[Drawing 1]



[Drawing 2]



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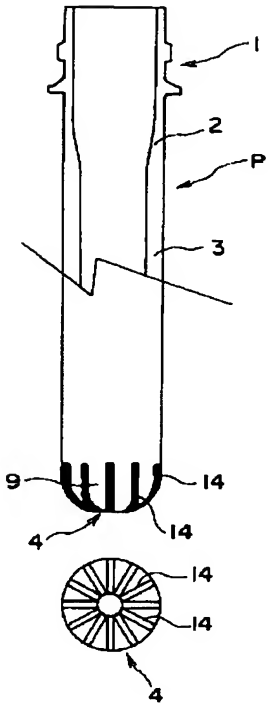

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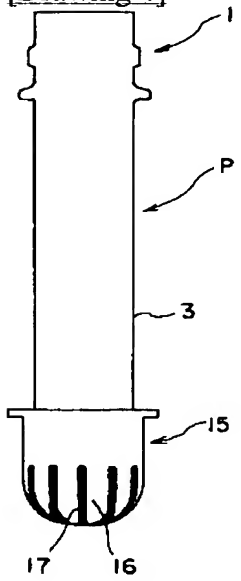

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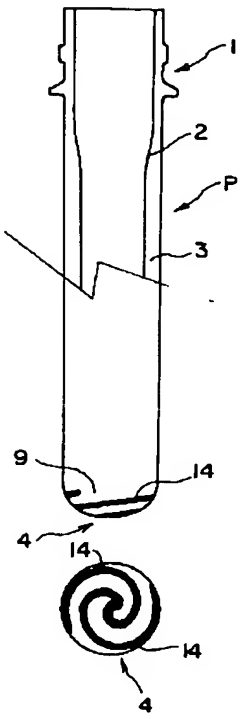
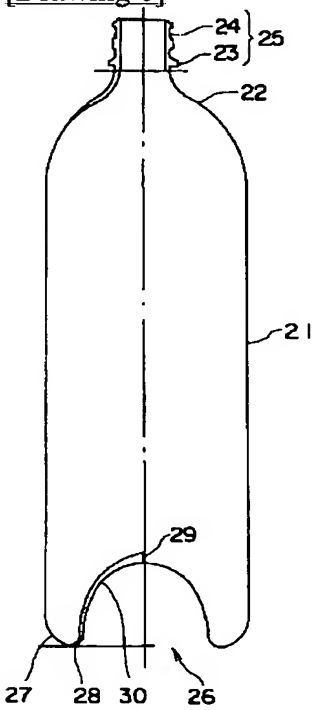
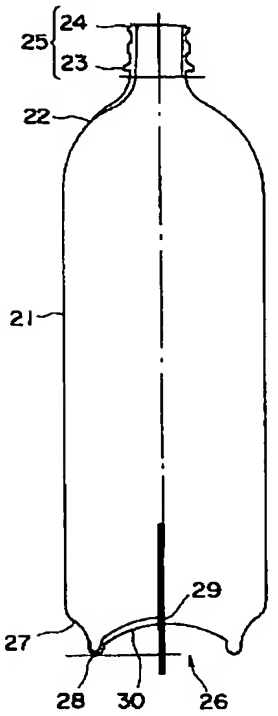


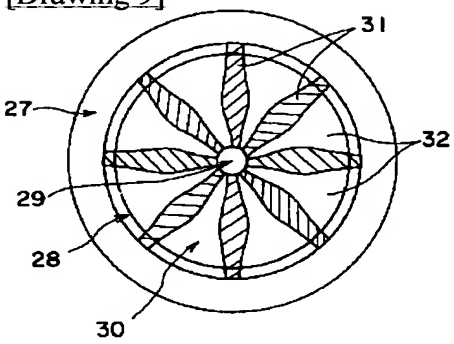
[Drawing 6]



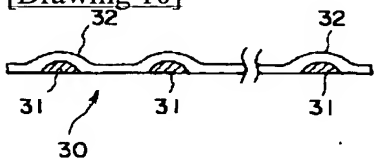
[Drawing 7]



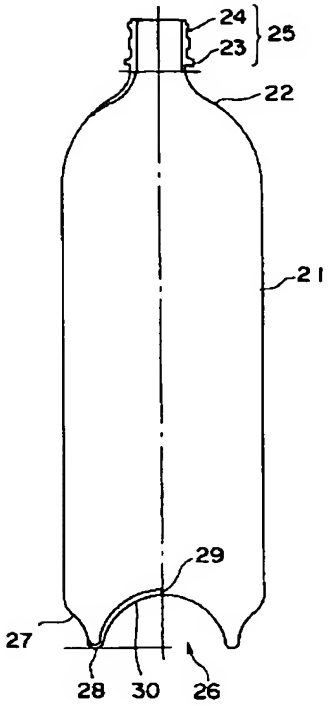
[Drawing 9]



[Drawing 10]



[Drawing 8]



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(71)出願人　000003768
東洋製罐株式会社
東京都千代田区内幸町１丁目３番１号

(72)発明者　桜井　英四郎
神奈川県横浜市港北区日吉本町５－32－17

(72)発明者　橋本　弘之
神奈川県川崎市多摩区宿河原６－18－８

(72)発明者　金子　友昭
神奈川県横浜市西区西戸部町２－206

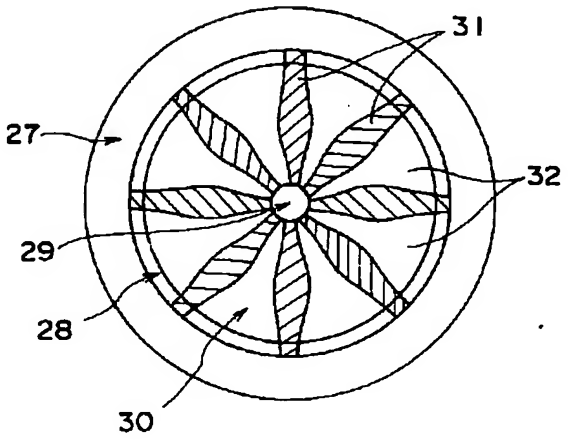
(74)代理人　弁理士　鈴木　郁男

(54)【発明の名称】　ポリエステル製ボトル及びその製造に用いるプリフォーム

(57)【要約】　(修正有)

【目的】　容器底部の厚みを比較的小さいレベルに保ちながら、十分な補強効果と、耐圧性と耐熱性とが得られ、しかもその生産性の高い、ポリエステル製ボトルを提供する。

【構成】　ポリエステルの二軸延伸ブロー成形で製造され、口頸部とこれに連なる錐台状肩部と筒状の胴部と閉塞底部とを備え、前記底部は下向きに径が小さくなる外周部２７と、これに連なる接地部２８と、底中心部２９と、底中心部と接地部とを接続する上向きに凸の湾曲部３０とから成るポリエステル製ボトルにおいて、前記湾曲部及び接地部には、底部中心から少なくとも接地部迄放射状に延びており且つ外表面から厚み方向の途中迄結晶化により白化された複数本の結晶化補強帯３１が非白化域３２を介して交互に設けている。



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【特許請求の範囲】

【請求項1】　ポリエステルの二軸延伸ブロー成形で製造され、口頸部とこれに連なる錐台状肩部と筒状の胴部と閉塞底部とを備え、前記底部は下向きに径が小さくなる外周部と、これに連なる接地部と、底中心部と、底中心部と接地部とを接続する上向きに凸の湾曲部とから成るポリエステル製ボトルにおいて、前記湾曲部及び接地部には、底部中心から少なくとも接地部迄放射状に延びており且つ外表面から厚み方向の途中迄結晶化により白化された複数本の結晶化補強帯が非白化域を介して交互に設けられていることを特徴とする底部が強化されたポリエステル製ボトル。

【請求項2】　ポリエステルの射出成形で形成され且つ口頸部とこれに連なる側壁部と閉塞底部とを備えた、ボトルへの二軸延伸ブロー成形に用いるプリフォームにおいて、前記側壁部の下部には、周方向に間隔をおいて縦方向或いはスパイラル方向に延びている結晶化白化帯が非白化域を介して交互に設けられていることを特徴とする二軸延伸ブロー成形プリフォーム。

【請求項3】　前記結晶化白化帯は側壁部の外表面から厚み方向の途中に達するように白化されている請求項2記載のプリフォーム。

【請求項4】　ポリエステルの射出成形で形成され、且つ口頸部とこれに連なる側壁部と閉塞底部とを備えた、ボトルへの二軸延伸ブロー成形に用いるプリフォームにおいて、前記側壁の下部には次第に径が小さくなるテーパー状接続部を介して上部よりも小径に且つ上部とほぼ同じ厚みに絞られた小径部が形成されており、この接続部及び小径部には、頂部が側壁外周面と面一となるように縦方向の外リブが周方向に間隔をおいて設けられ且つ前記外リブの大部分が結晶化により白化されていることを特徴とする二軸延伸ブロー成形用プリフォーム。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、改善された底部構造を有するポリエステル製ボトル及びそれを製造するためのプリフォームに関するもので、より詳細には、底部が薄肉化されていながら、圧力や熱による変形に対して補強された構造を有するポリエステル製ボトルに関する。

【0002】

【従来の技術】ポリエチレンテレフタレート（ＰＥＴ）のようなポリエステルを延伸ブロー成形して成るボトルは、軽量で耐衝撃性と透明性とに優れており、しかも耐気体透過性にも優れていることから、各種飲料、特にビールや炭酸系飲料或いはウーロン茶、果汁等を収容するための容器として広く使用されるに至っている。このボトルにおいて、耐圧性や耐熱性の点で最も問題となる部分は底部であり、底部に種々の補強構造を導入すること、及び底部に補強構造を導入するためにプリフォームにリブ等を設けることについても既に幾つかの提案がな

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されている。

【0003】例えば、特開昭５５－７１２４５号公報には、二軸延伸ブロー成形用のプリフォームにおいて、底部の壁面に上下方向に沿って複数の突条リブを形成させることが記載されている。また、特公昭６３－１１２１２号公報には、二軸延伸ブロー成形ポリエステルボトルにおいて、底部に内向きの帽状体を形成すると共に、帽状体の上端部から胴部の下部にいたる複数本の中実の突条リブを放射状に設けることが記載されている。更に、特開昭６０－１７２６３６号公報には、二軸延伸ブロー成形ポリエステルボトルにおいて、底部にその中心より放射状に複数の厚肉リブを設け、底部をリブ及びリブの周囲部分において結晶化させることが記載されている。

【0004】プリフォームに補強リブを設ける他の提案として、実公平４－２５２９６号公報には、底部の壁面に凸起状の縦リブを壁面の内外に設け、この縦リブを垂直方向で同一面上にあるようにすることが記載されている。

【0005】

【発明が解決しようとする課題】上記先行技術における提案は、底部にリブを設けることにより、その補強効果によって、耐圧性及び耐熱性を向上させようとするものであり、そのために底部となる部分に厚肉のリブを設けたプリフォームを用いるものであるが、ボトルの目付け量を節約しながら、十分な補強効果を発現させるという目的や、その生産を効率よく行うという目的には未だ十分満足し得るものではなかった。

【0006】底部となる部分に厚肉のリブを設けたプリフォームを、二軸延伸ブロー成形に使用すれば、ボトル底部に確かに補強リブを形成し得るが、ブロー成形時に樹脂の流動が生じるため、補強リブを意図した程厚肉化することができず、期待した程の補強効果を得ることができない。

【0007】勿論、底部の全体の肉厚を厚くすれば、補強リブも厚くなり、圧力に対して十分な補強効果が得られるが、この場合には、ボトルの目付け量が増大して、ボトルの重量が大きくなり、その製造コストも高くなるという欠点を生じる。本発明者らによる実験によると、肉厚の補強リブは、耐圧性の向上にはある程度の効果があるが、ボトル底部の耐圧性の向上、底部の熱変形の防止には余り有効でないことが分かった。

【0008】この点において、特開昭６０－１７２６３６号公報にみられる提案、即ち、底部にその中心より放射状に複数の厚肉リブを設け、底部をリブ及びリブの周囲部分において結晶化させることは、ボトル底部に耐熱性を付与する上で有効であるが、この提案では、成形後のボトル底部を加熱して、結晶化させねばならなく、そのため生産性が悪く、装置が大型化するという欠点がある。

【0009】従って、本発明の目的は、容器底部の全体

としての厚みを比較的小さいレベルに保ちながら、十分な補強効果と、それによる耐圧性と耐熱性とが得られ、しかもその生産性も高く、製造も容易であるポリエステル製ボトルを提供するにある。

【００１０】本発明の他の目的は、底部の全体としての厚みが小さい場合にも、十分な厚みの補強帯が確保され、しかも底部が剛性と強靭性とのバランスされた構造を有するポリエステル製ボトル及びその製造に用いるプリフォームを提供するにある。

【００１１】本発明の更に他の目的は、延伸ブロー成形に際して所定の形状、寸法の底形状への成形が容易に行われると共に、底部への結晶化補強帯の導入がプリフォームの段階で既に行われているポリエステルボトル形成用のプリフォームを提供するにある。

【００１２】

【課題を解決するための手段】本発明によれば、ポリエステルの二軸延伸ブロー成形で製造され、口頸部とこれに連なる錐台状肩部と筒状の胴部と閉塞底部とを備え、前記底部は下向きに径が小さくなる外周部と、これに連なる接地部と、底中心部と、底中心部と接地部とを接続する上向きに凸の湾曲部とから成るポリエステル製ボトルにおいて、前記湾曲部及び接地部には、底部中心から少なくとも接地部迄放射状に延びており且つ外表面から厚み方向の途中迄結晶化により白化された複数本の結晶化補強帯が非白化域を介して交互に設けられていることを特徴とする底部が強化されたポリエステル製ボトルが提供される。

【００１３】本発明によればまた、ポリエステルの射出成形で形成され且つ口頸部とこれに連なる側壁部と閉塞底部とを備えた、ボトルへの二軸延伸ブロー成形に用いるプリフォームにおいて、前記側壁部の下部には、周方向に間隔をおいて縦方向或いはスパイラル方向に延びている結晶化白化帯が非白化域を介して交互に設けられていることを特徴とする二軸延伸ブロー成形プリフォームが提供される。前記結晶化白化帯は側壁部の外表面から厚み方向の途中に達するように白化されているのがよい。

【００１４】本発明によれば更に、ポリエステルの射出成形で形成され、且つ口頸部とこれに連なる側壁部と閉塞底部とを備えた、ボトルへの二軸延伸ブロー成形に用いるプリフォームにおいて、前記側壁の下部には次第に径が小さくなるテーパー状接続部を介して上部よりも小径に且つ上部とほぼ同じ厚みに絞られた小径部が形成されており、この接続部及び小径部には、頂部が側壁外周面と面一となるように縦方向の外リブが周方向に間隔をおいて設けられ且つ前記外リブの大部分が結晶化により白化されていることを特徴とする二軸延伸ブロー成形用プリフォームが提供される。

【００１５】

【作用】本発明のボトルも、公知のボトルと同様に、ポリエステルの二軸延伸ブロー成形で製造され、口頸部とこれに連なる錐台状肩部と筒状の胴部と閉塞底部とを備え、この底部は下向きに径が小さくなる外周部と、これに連なる接地部と、底中心部と、底中心部と接地部とを接続する上向きに凸の湾曲部とを備えているが、湾曲部及び接地部に、底部中心から少なくとも接地部迄放射状に延びており且つ外表面から厚み方向の途中迄結晶化により白化された複数本の結晶化補強帯を非白化域を介して交互に設けたことが顕著な特徴である。

【００１６】ボトル底部の内、圧力及び熱に対して最も弱い部分は、応力の集中し易い接地部及び接地部から湾曲部に至る部分であり、これらの部分が膨出変形すると、ボトルの自立安定性が損なわれたり、自立性が損なわれない場合にもボトルが横方向に揺れるロッキング現象を生じたりする。また、この様な膨出変形を生じるとこの部分にクラックが発生して、器壁の強度自体も低下する傾向がある。

【００１７】本発明では、これを防止するために、湾曲部及び接地部に、底部中心から少なくとも接地部迄放射状に延びる様に、複数本の結晶化補強帯を設ける。この補強帯は、ポリエステルが結晶化されているため、剛性が大きく、熱変形温度も高く、圧力、更に熱が加わった場合にも、膨出変形を有効に防止する。

【００１８】この結晶化補強帯は、外表面から厚み方向の途中迄結晶化されることにより形成されていること、及び放射状であって、非白化域を介して交互に設けられていることが特に重要である。即ち、本発明のこの底部構造では、剛性のある結晶化（白化）補強帯が相互に独立した傘骨構造となり、一方強靭性のある延伸ポリエステル層（補強帯の未白化部分＋非白化域）が連続した状態で傘骨構造に支えられる傘布構造となり、底部器壁全体が薄い構造でも、上からの圧力に十分に耐え、しかも剛性と強靭性とが組み合わされたものとなっていることが了解されよう。

【００１９】本発明のこの底部構造のボトルは、ポリエステルの射出成形で形成され且つ口頸部とこれに連なる側壁部と閉塞底部とを備えたプリフォームであって、側壁部の下部には、周方向に間隔をおいて縦方向或いはスパイラル方向に延びている結晶化白化帯が非白化域を介して交互に設けられているものを使用し、これを二軸延伸ブロー成形することにより、製造される。

【００２０】このプリフォームを二軸延伸ブロー成形に使用すると、プリフォームの結晶化白化帯がボトル底部の結晶化補強帯となり、またプリフォームの非白化域がボトル底部の非白化域となって、前述したボトル底部構造が形成される。特に、プリフォームの結晶化白化帯が、二軸延伸ブロー成形時に、変形が少なく、非白化域の延伸開始固定端となるので、非白化域の延伸倍率が高くなり、非白化域の分子配向が有効に行われるという利点をももたらす。

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【0021】本発明のボトルを製造するには、プリフォームの状態で、加熱による結晶化乃至白化を行うので、成形後のボトル底部を加熱する煩わしさがなく、工程が簡単で、製造装置も大がかりなものを必要としないという利点がある。更に、プリフォームの外周側から加熱するの加熱操作も容易であり、この外周側からの加熱では、プリフォームの結晶化白化帯は側壁部の外表面から厚み方向の途中に達するように白化されるので、これにより、前述した傘骨－傘布構造の形成が、二軸延伸ブロー成形で容易に得られるという利点がある。

【0022】本発明の特に好適なプリフォームにおいては、プリフォーム側壁の下部に、次第に径が小さくなるテーパー状接続部を介して上部よりも小径に且つ上部とほぼ同じ厚みに絞られた小径部を形成し、この接続部及び小径部に、頂部が側壁外周面と面一となるように縦方向の外リブを周方向に間隔をおいて設け、しかも外リブの大部分を結晶化により白化させる。

【0023】この構成の外リブでは、外リブを設けた部分の壁の厚さが大きくなり、しかも外リブが結晶化されているため、十分な厚みの結晶化補強帯をボトル底部に形成することが可能となる。ボトル底部となるプリフォーム下部が、プリフォーム上部に比して小径に絞られているので、この部分の周方向延伸倍率が大きくなり、ボトル底部の分子配向度も大きくできることも了解されるべきである。

【0024】また、外リブが他の側壁下部に比して径外方に突出しているので、周囲からプリフォームを加熱したとき、外リブのみを選択的に熱結晶化できるという利点を与える。この様に、外リブに熱が集中するので、本発明によれば、プリフォームを延伸温度に加熱するための熱処理の段階で、外リブを熱結晶化でき、工程数も少なくして、生産性を向上させ得るといういう利点を与える。

【0025】

【実施例】本発明を、その理解が容易なように、ボトル形成用のプリフォームから説明する。

【0026】［プリフォーム］本発明の好適なプリフォームを示す図1（側面図）及び図2（図1のA－A、B－B，C－C，D－D及びE－Eの断面図）において、このプリフォームPは、ポリエステルの射出成形により形成され、大別して、口頸部1と、これに上方接続部2を介して連なる側壁部3と閉塞底部4とを備えている。口頸部1は密封用開口端5、蓋係合用ネジ部6及び支持リング7を備えている。この具体例において、上方接続部2は、口頸部1と内径がほぼ同一であるが、外径が下向きに増大して、肉厚も下向きに増大している。閉塞底部4は丸底となっている。

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【0027】側壁3は上部8、下部9及びこれらの間のテーパ状接続部10とから成っている。テーパ状接続部10は下向きに次第に径（内径及び外径共）が小さくなるものであり、下部9はこのテーパー状接続部10を介して上部8よりも小径に且つ上部9とほぼ同じ厚みに絞られて、小径部を形成している。

【0028】この接続部10及び小径部（下部）9には、図2によく示されるように、頂部11が側壁外周面12と面一となるように縦方向の外リブ13が周方向に間隔をおいて多数（図の具体例では8本）設けられている。

【0029】本発明では、これらの外リブ13を熱結晶化により白化するが、外リブ以外の小径部（下部）9は非白化域となっている。外リブ13はその断面でみて大部分が熱結晶化により白化して結晶化白化帯14と成っているが、必ずしも全部が白化していることを必要としない（尚、この具体例においては、外リブ13と結晶化白化帯14とは重複している）。勿論、外リブ13よりも内側の部分は非白化域となっていることが了解されるべきである。

【0030】外リブ13の結晶化の程度は、この部分が白化していれば十分であるが、厳密には、密度法結晶化度で評価できる。この結晶化度が、25％以上、特に35％以上であれば、十分な耐熱性と耐圧性とを付与することができる。

【0031】尚、密度法結晶化度とは、密度勾配管法によりポリエステルの密度を測定し、結晶化度X（％）を次式によって求められた値である。

【数1】

$$\frac{1}{d}=\frac{1-X}{da}+\frac{X}{dc}\qquad\left(X=\frac{dc}{d}\times\frac{d-da}{dc-da}\times 100\right)$$

ただし、dは25℃における測定密度（g/cm3）、da＝1.335g/cm3（完全非晶質ポリエステルの密度）、dc＝1.455g/cm3（完全結晶ポリエステルの密度）。

【0032】外リブ13の形状は特に制限されないが、図に示す具体例では、半円形であり、他に、放物線、双曲線、楕円等の二次曲線や、サイクロイド、三角形、台形等の任意の形状をとりうる。

【0033】外リブ13の大きさは、容器の大きさによっても変化し、一概に規定できないが、通常の包装容器、例えば内容量1500ml入りボトルの場合、外リブ13の高さは、15乃至40mm、特に20乃至30mmの範囲に、またその幅は2乃至8mm、特に3乃至5mmの範囲にあるのが好ましい。また、プリフォーム下部に設ける外リブ13の本数は、一般に3乃至12本、特に5乃至10本程度であることが好ましい。更に、外リブ13の長さは、ボトル底部の中心部から接地部までの距離にほぼ見合ったものであり、ボトルの大きさにもよるが、一般に20乃至100mm、特に30乃

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至６０mmの範囲にあるのが好ましい。

【００３４】本発明のプリフォームは、熱可塑性ポリエステルから成る。熱可塑性ポリエステルとしては、エチレンテレフタレート単位を主体とする熱可塑性ポリエステル、例えばポリエチレンテレフタレート（ＰＥＴ）やグリコール成分としてヘキサヒドロキシリレングリコール等の他のグリコール類の少量を含有せしめ或いは二塩基酸成分としてイソフタル酸やヘキサヒドロテレフタル酸等の他の二塩基酸成分の少量を含有せしめた所謂、改質ＰＥＴ等が使用される。これらのポリエステルは、単独でも或いはその本質を損なわない範囲で小量のナイロン類、ポリカーボネート或いはポリアリレート等の他の樹脂とのブレンド物の形でも使用し得る。また、熱可塑性ポリエステルを内外層とし、エチレンビニルアルコール共重合体やメタキシリレンアジパミド等の半芳香族ナイロン等のガスバリアー性樹脂中間層との多層構造であってもよい。

【００３５】用いる熱可塑性ポリエステルの固有粘度（η）はボトル形成用グレードでよく、ＥＶＯＨやＭＸーナイロン等との多層構成も含める。０．６５ｄｌ／ｇ以上、特に０．７０乃至０．９０ｄｌ／ｇの範囲にあり、且つジエチレングリコール単位の含有量が１．６０重量％以下、特に１．５０重量％以下の範囲内にあるものが好適に使用される。

【００３６】延伸ブロー成形に使用するプリフォームは、それ自体公知の射出成形法で製造される。即ち、溶融ポリエステルを射出し、最終容器に対応する口頸部を備えた前記形状の有底プリフォームを非晶質の状態で製造する。射出条件等は、特に限定されたものではないが、一般に、２６０乃至３００℃の射出温度、３０乃至６０ｋｇ／ｃｍ² の射出圧力で、プリフォームを成形することができる。

【００３７】かくして得られたプリフォームに耐熱性、剛性を与えるため、プリフォームの段階で螺合部、嵌合部、支持リング等を有する口頸部を熱処理により結晶化し白化せしめる場合があり、一方後述の２軸延伸ブローを完了したるものをボトル成形完了後、未延伸部分の口頸部を結晶化し、白化する場合もある。本発明のプリフォームにおいて、結晶化補強帯は外リブに形成されているのが、最も好ましいが、必ずしもこの例に限定されない。

【００３８】プリフォームの他の例を示す図３（一部断面側面図及び底面図）において、このプリフォームＰは、ポリエステルの射出成形により形成され、やはり口頸部１と、これに上方接続部２を介して連なる側壁部３と閉塞底部４とを備えているが、底部４から胴部の下方部分９に放射状に延びている複数本の結晶化白化帯１４が設けられている。この結晶化白化帯１４は、外表面から厚み方向の途中に達するようなものであり、成形後のプリフォームを熱処理することにより形成される。

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【００３９】この熱処理を説明するための図４において、成形されたプリフォームＰに、底部結晶化用マスキングユニット１５を使用し、プリフォームＰの底部外面にこのユニット１５をはめ込み、結晶化のための熱処理を行う。ユニット１５は、熱遮断壁１６と、結晶化白化帯形成用の開口した窓１７とを有しており、この窓を通過した赤外線により、窓１７に対応する形状及び寸法の結晶化白化帯がプリフォーム２に形成される。この場合には、結晶化白化帯形成用の加熱と、プリフォームの延伸温度への加熱とは、処理温度が異なるので、一般に２段に行われる。

【００４０】本発明のプリフォームＰにおいて、結晶化補強帯１４は底部に放射状に設けられ、胴部下部にも軸方向に若干延びているが、底部中心から径外方向に延びておればよく、例えば螺旋状に白化帯が延びていてもよい。

【００４１】プリフォームの更に他の例を示す図５（一部断面側面図及び底面図）において、このプリフォームＰは、全体としての構造は図４と共通しているが、底部４の中心から胴部の下方部分９に螺旋状に延びている複数本の結晶化白化帯１４が設けられている点が相違している。この結晶化白化帯１４も、外表面から厚み方向の途中に達するようなものであり、成形後のプリフォームを図４と同様に熱処理することにより形成される。

【００４２】［ボトル］本発明の耐熱乃至耐熱圧ボトルの全体の配置の一例を示す図６、図７及び図８（一部断面側面図）において、この耐熱乃至耐圧ボトルＢは、筒状の胴部２１、胴部の上端に接続された釣鐘状（錐体状）の肩部２２、肩部上方のサポートリング２３及びリング上方のノズル部２４から成る口頸部２５を備えている。筒状の胴部２１の下端には、以下に詳細に説明する底部２６が設けられている。

【００４３】本発明の耐熱及び／又は耐圧ボトルＢにおける底部２６は、下向きに径が小さくなる外周部２７と、これに連なる接地部２８と、底中心部２９と、底中心部２９と接地部２８とを接続する上向きに凸の湾曲部３０とから成っている。

【００４４】図６に示す具体例においては、底外周部２７は、下向き且つ外向きに凸の曲線をなしており、このものは、ボトルの座りの良い耐熱ボトルとして有用である。図７に示す具体例においては、底外周部２７は、上向き且つ内向きに凸の曲線をなしていると共に、接地部２８が下向きの突出しており、このものは、底部の圧力に対する座屈のない耐圧ボトルとして有用である。図８に示す具体例においては、底外周部２７は図７のものと同様であるが、接地部２８からの底中心部２９の高さが高く、湾曲部３０の曲率も大きくなっており、より底の変形が厳しくなる用途、例えば、耐熱圧ボトルとしての用途に有用である。これら何れの場合にも接地部２８の内側の立ち上がりは９０度或いは９０度に近い急激な立

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ち上がりをしていることが耐圧性の点でよい。

【００４５】本発明では、これらの湾曲部３０及び接地部２８に、底部中心２９から少なくとも接地部２８迄放射状（螺旋状も含む）に延びており且つ外表面から厚み方向の途中迄結晶化により白化された複数本の結晶化補強帯を非白化域を介して交互に設ける。

【００４６】図６のボトル底部２６を幾分模式化して示す図９（底面図）及び図６におけるＸ－Ｘ軸方向円周断面展開図（図１０）において、湾曲部３０及び接地部２８には、複数本（図では１０本）の放射状の結晶化補強帯３１（斜線で示す。）が形成されている。結晶化補強帯３１の間には非白化域３２が位置しており、これらは交互に配置されている。結晶化補強帯３１は、底部中心２９との境界から、少なくとも接地部２８を通るように放射状に延びていることが了解されよう。

【００４７】図１０の断面展開図に最もよく示されるように、結晶化補強帯３１は底部の下面から底壁の厚み方向の途中に至るように形成されており、その上方は非白化域３２で覆われている。図１０に示す具体例では、結晶化補強帯３１及びその近傍において、他の部分に比してやや厚肉に盛り上がっており、傘骨－傘布構造をより強固なものとしている。図９のものでは、結晶化補強帯３１は、接地部２８の外縁に至るように形成されているが、勿論これを通り過ぎて底外周部或いは更に胴部の下端縁にまで達していてもよい。

【００４８】本発明において、結晶化補強帯の平均的な厚み、幅、長さ及び結晶化度等は、二軸延伸ブロー成形における変化が少ないので、プリフォームのそれと殆ど等しいが、若干幅が広がり、厚みが減少する場合もある。本発明において、接地部の内径、湾曲部の外径（Ｄ）は一般に５０乃至７０mm，底中心部の高さ（Ｈ）は一般に１５乃至３０mmの範囲にあるのがよい。本発明のボトル胴部は勿論、それ自体公知の胴部構造を有することができ、例えば、縁取られたラベル貼着部や、減圧吸収用のパネル－リブ構造を有していてもよい。

【００４９】本発明のボトルは、前述した結晶化白化帯が形成されたブロー成形用プリフォームを、延伸温度、一般に９５乃至１２０の温度で二軸延伸ブローする。中空金型内に、上記温度に予備加熱されたプリフォームを装着し、該プリフォームを周方向に膨張延伸させると共に、軸方向に引っ張り延伸させ、且つ底打ちをする。

【００５０】最終容器における延伸倍率は、面積倍率で５乃至１４倍、特に７乃至１２倍が適当であり、一方軸方向延伸線倍率は２乃至３．５倍、特に２．５乃至３倍とし、周方向延伸線倍率は２乃至５倍、特に３乃至４倍とするのがよい。

【００５１】実施例１．射出用グレードのポリエチレンテレフタレート（ＰＥＴ）を、３００℃の温度で射出して、図１及び図２に示す形状のプリフォームを製造し

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た。各部の寸法は次の通りである。

【００５２】ＰＥＴ目付量　　６３g，
口径　　２８mm，
全高　　１４７．５mm，
胴上部外径　　２９．３mm，
胴上部内径　　１９．８mm，
胴下部外径　　２８mm，
胴下部内径　　１９mm，
胴下部長さ　　４０mm，
外リブ長さ　　４０mm，
外リブ高さ　　２．６mm，
外リブ幅　　５mm。

【００５３】上記外リブ付きプリフォームを回転させながら、赤外線加熱器により加熱し、プリフォーム全体を延伸温度に予備加熱すると共に、外リブを結晶化により白化させた。外リブの表面温度は１４０℃で白化したが、それ以外の部分は白化していないことが確認された。外リブの結晶化度は、３５％であり、それ以外のところの結晶化度は、１５％であった。外リブにおいて、最も厚い部分での白化厚みは３mmであった。

【００５４】このプリフォームを、公知の二軸延伸ブロー成形装置で、下記寸法のボトルに成形した。

内容積　　１５００ml，
口径　　２８mm，
全高　　３０５mm，
胴部最大径　　９８mm，
底部
接地部の内径（Ｄ）　　６０mm，
中心部の高さ（Ｈ）　　２０mm，
Ｈ／Ｄの比　　０．３３

【００５５】上記ボトルに、８５℃の熱水８００gを充填し３分間放置した後、熱水を取り除き、パック前の接地面からの底中心の高さと、パック後のそれとを比較した。高さの変化量は１．５５mmであった。

【００５６】比較のため、実施例１と同じ目つけ量のプリフォームで、結晶化されていないものを用いる以外は、上記と同様にして、ボトルを製造した。このボトルについて、上記と同様の試験を行ったところ、高さの変化量は、４．３０mmであり、本発明のボトルが熱安定性に顕著に優れていた。

【００５７】

【発明の効果】本発明によれば、下向きに径が小さくなる外周部と、これに連なる接地部と、底中心部と、底中心部と接地部とを接続する上向きに凸の湾曲部とを備えている二軸延伸ブロー成形ボトルにおいて、これらの湾曲部及び接地部に、底部中心から少なくとも接地部迄放射状に延びており且つ外表面から厚み方向の途中迄結晶化により白化された複数本の結晶化補強帯を非白化域を介して交互に設けたことにより、容器底部の全体としての厚みを比較的小さいレベルに保ちながら、十分な補強

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効果と、それによる耐圧性と耐熱性とが得られる。

【0058】この補強帯は、ポリエステルが結晶化されているため、剛性が大きく、熱変形温度も高く、圧力、更に熱が加わった場合にも、膨出変形を有効に防止する。この結晶化補強帯は、外表面から厚み方向の途中迄結晶化されることにより形成され、しかも放射状であって、非白化域を介して交互に設けられているため、剛性のある結晶化（白化）補強帯が相互に独立した傘骨構造となり、一方強靭性のある延伸ポリエステル層（補強帯の未白化部分＋非白化域）が連続した状態で傘骨構造に支えられる傘布構造となり、底部器壁全体が薄い構造でも、上からの圧力に十分に耐え、しかも剛性と強靭性とが組み合わされたものとなっている。

【0059】本発明のこの底部構造のボトルは、側壁部の下部には、周方向に間隔をおいて縦方向或いはスパイラル方向に延びている結晶化白化帯が非白化域を介して交互に設けられているプリフォームを使用し、これを二軸延伸ブロー成形することにより、製造されるので、後からの熱処理による結晶化工程が不要であり、製造も容易であるという利点をもたらす。また、プリフォームの結晶化白化帯が、二軸延伸ブロー成形時に、変形が少なく、非白化域の延伸開始固定端となるので、非白化域の延伸倍率が高くなり、非白化域の分子配向が有効に行われるという利点をももたらす。

【0060】本発明では、プリフォームの状態で、加熱による結晶化乃至白化を行うので、成形後のボトル底部を加熱する煩わしさがなく、工程が簡単で、製造装置も大がかりなものを必要としないという利点がある。更に、プリフォームの外周側から加熱するの加熱操作も容易であり、この外周側からの加熱では、プリフォームの結晶化白化帯は側壁部の外表面から厚み方向の途中に達するように白化されるので、これにより、前述した傘骨ー傘布構造の形成が、二軸延伸ブロー成形で容易に得られるという利点がある。

【0061】特に外リブを設けたプリフォームでは、この外リブが他の側壁下部に比して径外方に突出しているので、周囲からプリフォームを加熱したとき、外リブのみを選択的に熱結晶化できるという利点を与える。この様に、外リブに熱が集中するので、本発明によれば、プリフォームを延伸温度に加熱するための熱処理の段階で、外リブを熱結晶化でき、工程数も少なくして、生産性を向上させ得るといういう利点を与える。

【図面の簡単な説明】

【図1】本発明の好適なプリフォームを示す側面図である。

【図2】図1のA－A、B－B，C－C，D－D及びE－Eの断面図であり、A，B，C，D及びEはA－A、B－B，C－C，D－D及びE－Eの断面に相当する。

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【図3】本発明のプリフォームの他の例を示す一部断面側面図及び底面図である。

【図4】図3のプリフォームを形成するための熱処理を説明するための説明図である。

【図5】本発明のプリフォームの更に他の例を示す一部断面側面図及び底面図である。

【図6】本発明の耐熱ボトルの一例の全体の配置の一例を示す一部断面側面図である。

【図7】本発明の耐圧ボトルの一例の全体の配置の一例を示す一部断面側面図である。

【図8】本発明の耐熱圧ボトルの一例の全体の配置の一例を示す一部断面側面図である。

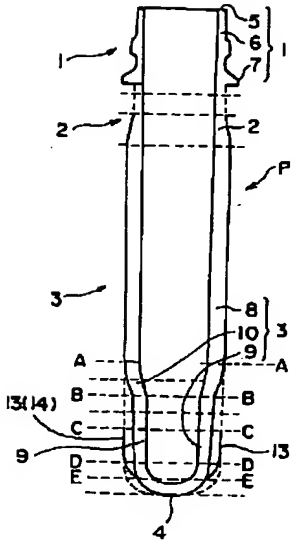
【図9】図6のボトル底部を幾分模式化して示す底面図である。

【図10】図6におけるX－X軸方向円周断面展開図である。

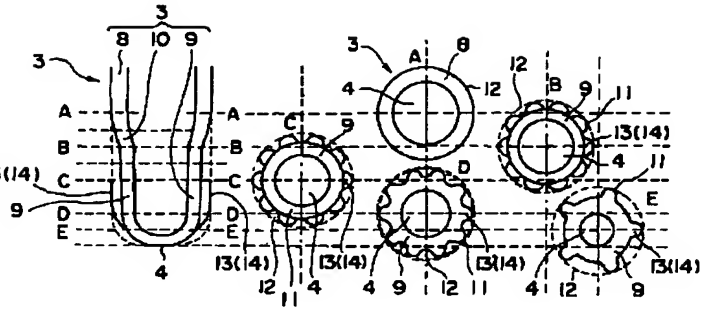
【符号の説明】

P　プリフォーム
1　口頸部
2　上方接続部
3　側壁部
4　閉塞底部
5　密封用開口端
6　蓋係合用ネジ部
7　支持リング
8　側壁の上部
9　側壁の下部
10　テーパ状接続部
11　外リブの頂部
12　側壁外周面
13　外リブ
14　結晶化白化帯
15　底部結晶化用マスキングユニット
16　熱遮断壁
17　結晶化白化帯形成用の開口した窓
B　耐熱乃至耐圧ボトル
21　筒状の胴部
22　錐体状の肩部
23　サポートリング
24　ノズル部
25　口頸部
26　底部
27　外周部
28　接地部
29　底中心部
30　湾曲部
31　結晶化補強帯
32　非白化域

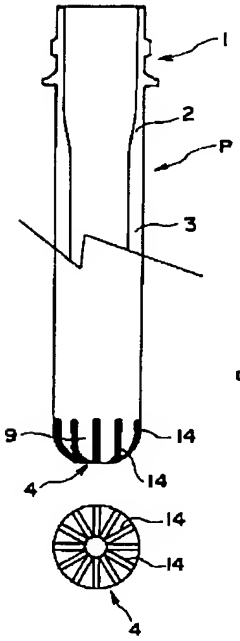
【図１】



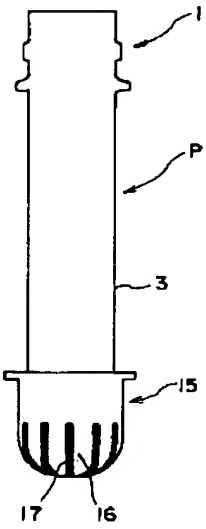
【図２】



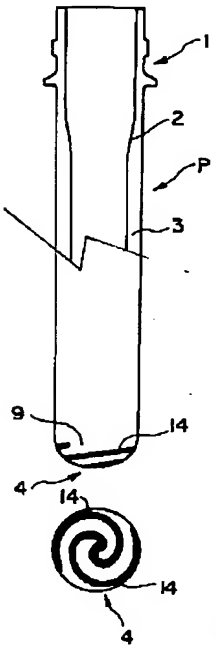
【図３】



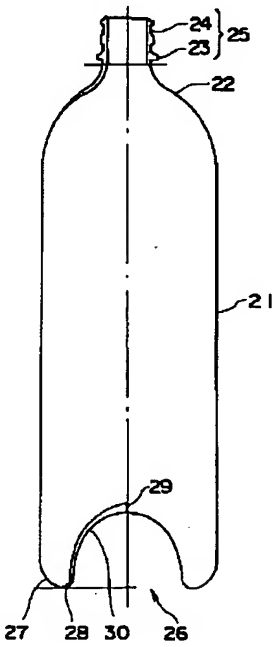
【図４】



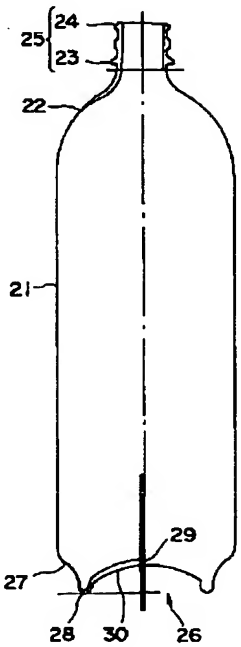
【図５】



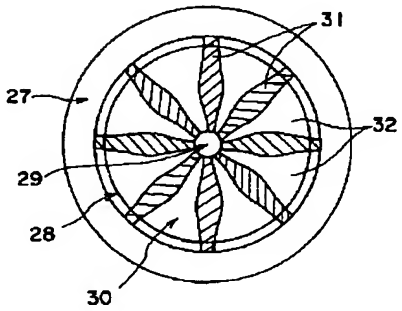
【図６】



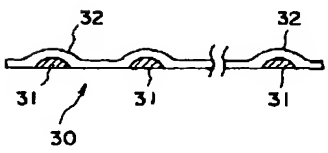
【図７】



【図９】



【図１０】



【図8】